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ABSTRACT

This paper discusses the design and results for the evaluation of an environmental education institute program held at Tennessee Technological University from July 1976 to June 1977. The 26 participants completed pre- and post instruments which included items of both attitudinal and knowledge composition. The goals for the evaluation of the program were: (1) to increase environmental knowledge in selected areas of the participants; (2) to create an awareness of environmental issues and possible solutions; (3) to present interesting sessions; and (4) to develop plans of action. One part of the instrument consisted of 50 cognitive multiple-choice items. Other parts were 25 Likert type items, semantic differential items, and written comments. Data were subjected to F-ratios, t-tests and other statistical procedures. Summary data and statistics are given for test items. Both positive and negative comments from participants are included along with a discussion of selected items. (MR)

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COGNITIVE AND AFFECTIVE CHANGES OF ENVIRONMENTAL EDUCATION

-- A MODEL FOR EVALUATION

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INTRODUCTION

This paper discusses the design and results for the evaluation of an environmental education institute program held on the campus of Tennessee Technological University from July, 1976 to June, 1977. The twenty-six participants were asked to complete an evaluative instrument which included items of both an attitudinal and knowledge composition. The pre-to-post assessment determined areas where change occurred as a result of the one-year program of study funded by the United States Office of Education.

The detailed plan for the evaluation of the program involved a holistic approach to attain a comprehensive view of the success or failure of the program. This holistic evaluation was directed toward determining the program effectiveness in achieving the following goals:

1. Increasing the basic knowledge of the participants in the several areas related to environmental education.
2. Producing an awareness of the issues and possible answers to many of the controversial problems relating to environmental problems.
3. Presenting to the participants an interesting and effective series of lectures, discussions and other experiences in environmental education.
4. Leading each participant toward the completion of specific Plans of Action directly related to the implementation of environmental education in their respective schools.

Research data resulted from OEE grant #G007602027 to Tennessee Technological University.

The model of evaluation followed for assessing the achievements of the participants relative to the above goals is discussed in the following pages.

EVALUATION

The evaluation model designed for the comprehensive assessment included several components. To assess the pre-to-post gains in basic knowledge, an instrument consisting of fifty items was prepared from a sample of the terms included in the glossary of common environmental terms constructed by Studdard.[1] These included information from all aspects of the program. A special effort was made to develop items which had five choices that would require discrimination by the Institute participants. The participants completed the instrument on the first day of their arrival at the Institute Program during the 1976 Summer Session. The same instrument was administered again on June 7, 1977. Comparison of pre-to-post scores for the participants who completed both of the tests indicated statistically significant gains at the 0.007 level of measurement. The mean of the raw scores for the fifty-item test was 35.17 on the pre-test and 39.09 on the post-test, a gain of 3.91 over the year. The pre and post scores for individual participants are in Table I. The complete assessment instrument and statistical data for the analysis are included in Appendix A.

Two attitudinal instruments were developed to assess changes in the opinions of the participants over the duration of the Institute Program. The first of the instruments included 25 items rated according

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[1]Gloria J. Studdard, "Common Environmental Terms: A Glossary," Environmental Protection Agency, Washington, D. C., 1973, 27 pages, ERIC Number ED 103 217.

TABLE I

PRE-POST SCORES OF INSTITUTE PARTICIPANTS

ON THE KNOWLEDGE COMPONENT OF THE PROGRAM EVALUATION

Participant	Pre	Post
1	35	41
2	31	39
3	39	42
4	41	38
5	32	--
6	45	48
7	49	--
8	33	47
9	36	42
10	39	43
11	31	21
12	28	35
13	39	42
14	42	48
15	32	25
16	30	39
17	42	46
18	49	48
19	35	--
20	38	44
21	20	40
22	42	45
23	24	24
24	31	32
25	29	37
26	33	33
	--	35
	$\overline{X}$ = 35.17	$\overline{X}$ = 39.09

to the Likert scaling technique.[2] The results from the pre-to-post assessment revealed that statistically significant changes occurred in only three of the 25 items though trends (non-significant) were indicated in a number of the other items. The participants rated the item *"The use of nuclear fission as a source to meet future energy needs is a most promising method."* significantly ($p = 0.0567$) less after the Institute Program than before the Institute Program. They also rated the item *"The development of freshwater lakes is one major way to increase energy resources without damaging the environment."* less positively after the Institute Program ($p = 0.0070$). Likewise, the participants rated the item *"Land which is strip-mined can be successfully reclaimed to former productivity in less than ten years."* significantly more negative after the Institute Program ($p = 0.0081$). The complete statistical analysis for the data is in Appendix B.

A second attitudinal type instrument was developed which was modeled after the semantic differential technique of Osgood.[3, 4] An exemplary model of an instrument developed by Mehne and Goulard[4, 5] utilized the technique in assessing attitudes of individuals on a number of environment-related problem areas. After studying the instrument, it was decided that few of the choices and bipolar adjectives were appropriate for the evaluation of the Institute Program.

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[2]John W. Best. Research in Education - Third Edition. Prentice-Hall Inc., Englewood Cliffs, N. J. 1977, p. 171.

[3]Osgood, C. E., and Suci, G. and Tannenbaum, P. The Measurement of Meaning. Urbana: University of Illinois Press, 1957.

[4]Snider, J. G. and Osgood, C. E. (Eds.). Semantic Differential Techniques. Chicago: Aldine Publishing Company, 1969.

[5]Mehne, Paul R. and Goulard, Gary J. "Environmental Attitudes Semantic Differential," 1973, 15 pages, ERIC Document Number ED 108 879.

Hence, an instrument was constructed on the same format which was appropriate to the program. The twelve areas assessed and the seven bipolar scales are included with the instrument in Appendix C. The results from the pre-to-post assessment resulted in statistically significant changes in only six of the items. Participants viewed the problems related to strip-mining as being more complex after attending the Institute Program ($p = 0.0193$). The participants also viewed the use of forests more positively as a result of their experiences in the Institute Program ($p = 0.0445$), saw the use of forests as being more successfully managed significantly after the Institute Program ($p = 0.0047$). The results from the analysis also reflected a significant trend toward a bad versus good outlook regarding breeder reactors ($p = 0.0007$). They also shifted their attitudes from a realistic to a somewhat neutral to unrealistic one regarding breeder reactors ($p = 0.0422$). On the scale, realistic to unrealistic regarding attitudes toward gas mileage for cars, the group became much more realistic ($p = 0.0360$).

In order to assess the participants' satisfaction with each component of the Institute Program, an instrument listing each of the excursions and presentations was presented to the participants for their evaluation. The scale "excellent to poor" was used for each of the 46 events of the Program. It was determined that the majority of the average ratings ranged from 3.25 to 3.95 on the five-point maximum scale. Five of the seven ratings related to the field trips were evaluated above the 4.15 level while only five of the presentations were evaluated above the 4.0 level. The ratings which were lower than 3.00 were related to the sessions on Energy and Economics and Zero

Energy Growth with ratings of 2.24 and 2.41 respectively. Results from the ratings are given in Table II.

During Phase II, the participants were exposed to an expansive and effective series of lectures and discussions on various energy and environmental issues. At the end of each quarter, the participants submitted for evaluation a written statement, which was a synthesis of lectures concluded in that particular quarter.

On the very last day of Phase III, all participants were given an opportunity to present written evaluations of the program as a whole. Representative quotes, both positive and negative, from this evaluation are given below:

Positive:

"I have changed my attitude about energy quite a bit. Many things I've never heard of or thought about were brought to my attention."

"I think my learning experience will be long remembered."

"My attitude towards the subject matter of energy and environment changed a great deal during this past year. Now I feel confident about teaching about energy."

"I only wish more teachers in Tennessee got an opportunity like this to learn to teach about energy."

"I especially enjoyed the field trips."

"Being a social science teacher, I never thought field trips could be such a wonderful teaching and learning experience."

"You can bet my pupils are going to get more field trips to learn about our environmental problems."

"Even though my basketball schedule interfered with Phase II to some extent, I got a great deal out of the seminar speakers."

"The way the Institute was organized gave us a good and effective way to learn."

"I never thought I could learn so much in such a short time. My attitude has certainly changed."

"We need another Institute like this to get more teachers trained."

TABLE II

Please rate each of the following field experiences by placing number 1-5 in items 1-7. Use the scale:

5 Excellent
4 Above Average
3 Average
2 Below Average
1 Poor

		Mean Rating
1.	Oak Ridge National Laboratory	3.64
2.	Nashville Thermal Transfer Plant	4.43
3.	Copperhill	4.76
4.	Ocoee Dam and Reservoir	3.32
5.	Cedars of Lebanon State Park	4.17
6.	Fall Creek Falls State Park	4.83
7.	Sequoah Nuclear Power Plant	4.29

Each of the following presentations was made during the duration of the Energy-Environment Institute. Please rate each of them according to the above scale.

8.	Conservation	3.96
9.	Energy and Food Production	3.76
10.	History of Water Usage	3.52
11.	History of Environmental Awareness	3.45
12.	Conservation of Natural Resources	3.81
13.	Energy and Environment	3.06
14.	Energy and Environment	3.63
15.	Coal	3.76
16.	Uranium Cycle	3.65
17.	Energy Production	3.28
18.	Environment	3.89
19.	Petroleum	3.84
20.	Energy and Environment	3.23
21.	Energy and Economics	2.24
22.	Environmental Carcinogens	3.59
23.	Sociological Aspects of Building a Power Plant	3.47
24.	Energy Crisis	3.25
25.	Energy Crisis	3.41
26.	Pyrolysis: New Way to Produce Energy	3.65
27.	New Uses for Coal	3.44
28.	Water Quality	3.11
29.	Water Quality	3.60
30.	Noise Pollution	3.95
31.	Conservation	3.74
32.	Fusion Reactors	3.50

TABLE II CONTINUED

		Mean Rating
33.	Energy and Population Growth	3.64
34.	Environmental Effects of Radiation	3.00
35.	Zero Energy Growth	2.41
36.	Environmental Noise	3.71
37.	Teaching Environmental Education	3.68
38.	SO_2 Emissions	3.73
39.	Environmental Law	3.71
40.	Ecological Principles	4.73
41.	Energy Resources and Economic Principles	4.35
42.	Evaluation	4.39
43.	Art	4.05
44.	Supervision	3.28
45.	Demonstration of Teaching Materials	4.29
46.	Demonstration of Teaching Skills	3.18

Negative:

"The textbooks used in Phase I were good, but the NSTA Resource Book was written to bore you."

"The NSTA Resource Book was difficult to read."

"Many of us did not have a solid background to begin with, and some of the Phase II speakers were way above our heads -- at least mine!"

"The so-called 'energy specialists' did not know how to talk to laymen."

"Some of the Phase II speakers gave the impression that the only way to solve energy problems is their way."

"Many of us did not know how to go about (or what was required!) writing the Plan of Action."

"Phase III was certainly confusing."

"Especially in Phase III, we were worked to death!"

"It took me almost a week to comprehend the work load of Phase III."

"Our schools are not set up to each energy and environment subjects the way it should be done."

Each participant did complete a Plan of Action for implementing environmental education in his/her school. These were evaluated by the writers for their qualitative and functional integrity. They were found to be of sufficient depth. They all reflected an understanding and comprehension of the energy-related problems this country faces.

METHOD FOR ANALYZING DATA

The computer at Tennessee Technological University was utilized in the analysis of the data. Another useful tool was employed in the data collection phases of the study. Specifically, all data were collected on standard mark-sense answer sheets and read into a data file. This enabled the writers to bypass the keypunching of the 159

item instrument. Secondly, the Statistical Package for the Social Sciences (SPSS) was used to compiete the F-ratios, T-tests, and other descriptive statistics. This nationally recognized program, available in many college and university computing centers, is easily programmed (interfaced) and includes most any statistical analysis needed for studies in education.

APPENDIX A

RESULTS FROM THE COGNITIVE TEST ON ENVIRONMENTAL EDUCATION

Please answer each of the following by marking the single most correct choice.

	Scores	
	Pre-Test	Post-Test
1. This refers to life or processes that can occur only in the presence of oxygen. A. Adsorption B. Biodegradable C. Autotrophic D. Aerobic E. Absorption	56.52%	69.57%
2. The adhesion of a substance to the surface of a solid or a liquid. A. Adsorption B. Absorption C. Autotrophic D. Effluent E. Flocculation.	47.83%	30.43%
3. The employment of living organisms to determine the biological effect of some substance, factor, or condition. A. Biological Oxidation B. Bioassay C. Carcinogenesis D. Eutrophication E. Isomerization.	43.48%	52.17%
4. Single-celled microorganism that lack chlorophyll and are sometimes useful and sometimes harmful to man. A. Bacteria B. Plankton C. Curies D. Herbivores E. Fluorocarbons.	95.65%	86.96%
5. A chemical agent used to break up concentrations of organi material, such as an oil spill. A. Germicide B. Herbicide C. Dispersant D. Fluorocarbon E. Hydrocarbon.	91.30%	95.65%
6. A discharge of pollutants into the environment, partially or completely treated or in its natural state. A. Flocculation B. Eutrophication C. Fusion D. Filtration E. Effluent.	21.74%	47.83%
7. The addition of nitrogen, phosphorous and carbon compounds or other nutrients into a waterway. A. Flocculation B. Enrichment C. Oxidation D. Biodegradation E. Eutrophication.	17.39%	26.09%
8. The study of diseases as they affect populations. A. Eutrophication B. Epidemiology C. Flocculation D. Monitoring E. Phytotoxication.	91.30%	82.61%

		Scores Pre-Test	Post-Test
9.	Waves of radiant nuclear energy which are very penetrating. A. Alpha Particles B. Beta Particles C. Gamma Rays D. Neutrinos E. Mesons.	82.61%	91.30%
10.	The process of splitting large radioactive atoms into smaller atoms and particles with the resulting release of great amounts of energy. A. Inversion B. Fusion C. Dispersion D. Fission E. Enrichment.	73.91%	86.96%
11.	A vast family of compounds found especially in fossil fuels which sometimes are the cause of smog. A. Hydrocarbons B. Fluorocarbons C. Gamma Rays D. Ozones E. Isomers.	78.26%	86.96%
12.	An atomospheric condition where a layer of cool air is trapped by a layer of warm air where it cannot rise. A. Leaching B. Inversion C. Fusion D. Absorption E. Dispersion.	78.26%	86.96%
13.	A fine dust produced by plants; a natural pollutant. A. Rubbish B. Pollen C. Plankton D. Ozone E. Stagnation.	100.00%	91.30%
14.	The floating or weakly swimming plant and animal life in a body of water, often microscopic in size which serves as the beginning of the food chain. A. Sludge B. Rubbish C. Ozone D. Bacteria E. Plankton	95.65%	95.65%
15.	In pollution control work, any of a number of air pollution control devices usually using mechanical/ electrical means to collect particles from an emission. A. Absorbers B. Biological Control C. Precipitators D. Aerobic E. Autotron.	39.13%	73.91%
16.	Untreated domestic or commercial waste water. A. Sludge B. Pollen C. Rubbish D. Plankton E. Raw Sewage.	78.26%	91.30%

		Scores Pre-Test	Post-Test
17.	A method of controlling pests by means of introducing naturally occurring predatory organisms, sterilization or the use of inhibiting hormones. A. Epidemiology B. Herbicide C. Pesticide D. Biological Control E. Adsorption.	78.26%	78.26%
18.	Cancer producing. A. Autotrophic B. Phytotoxic C. Pathogenic D. Carcinogenic E. Organic	86.96%	91.30%
19.	A relative measure of the purity of water based on a count of unwanted bacteria. A. Bioassay B. Eutrophication C. Monitoring D. Coliform Index E. Isomerization.	69.57%	65.22%
20.	In waste water treatment, the process of separating suspended solids by chemical creations of clumps. A. Flocculation B. Eutrophication C. Dredging D. Inversion E. Adsorption.	60.87%	56.52%
21.	The process of decomposing quickly as the result of the action of microorganisms. A. Biodegradable B. Aerobic C. Absorption D. Adsorption E. Effluent.	82.61%	82.61%
22.	All solids such as charred paper, cinders, dust, soot, etc., which is carried in a gas stream. A. Effluent B. Dispersant C. Fly Ash D. Ground Cover E. Flocculant.	56.52%	78.26%
23.	A chemical or agent that kills microorganisms such as bacteria and prevents them from causing disease. A. Herbicide B. Herbivore C. Germicide D. Fluorocarbon E. Hydrocarbon.	91.30%	91.30%
24.	Grasses or other plants grown to keep soil from being blown or washed away. A. Leaching B. Ground Cover C. Plankton D. Rubbish E. Sludge.	100.00%	100.00%

		Scores Pre-Test	Post-Test
25.	A variation of an element having the same atomic number as the element itself but a different atomic mass. A. Isomer B. Inversion C. Eutrophication D. Allotrope E. Isotope.	73.91%	95.45%
26.	A heavy metal, highly toxic if breathed or ingested which is residual in the environment. A. Uranium B. Fluorocarbons C. Fly Ash D. Mercury E. Strontium.	86.96%	81.82%
27.	The process by which soluble materials in the soil are washed into a lower layer of soil or are dissolved and carried away by water. A. Inversion B. Absorption C. Dispersion D. Leaching E. Enrichment.	52.17%	65.22%
28.	Periodic or continuous determination of the amount of pollutants or radioactive contamination present in the environment. A. Biological Control B. Autotrophism C. Monitoring D. Phytotoxination E. Dredging.	82.61%	86.96%
29.	The study of the principles, mechanisms and affects of radiation on living matter. A. Radiobiology B. Phytotoxen C. Bioassay D. Monitoring E. Pathogenesis.	82.61%	91.30%
30.	The process by which waste materials are transformed into new products. A. Radiation B. Recycling C. Fusion D. Biological Control E. Fission.	95.65%	100.00%
31.	The construction of solids removed from sewage during waste water treatment. A. Sludge B. Stagnation C. Rubbish D. Plankton E. Recycling.	69.57%	86.96%
32.	A tremendous sound produced when a vehicle exceeds the speed of sound. A. Ozone B. Radiation C. Sonic Boom D. Adsorption E. Absorption.	100.00%	100.00%
33.	A controlled process of degrading organic matter by microorganisms. A. Biological Oxidation B. Biological Control C. Biodegradable D. Adsorption E. Composting.	21.74%	21.74%

		Scores Pre-Test	Post-Test
34.	A measure of radioactivity. A. Gamma Ray B. Curie C. Fusion D. Fission E. Uranium.	47.83%	56.52%
35.	A pesticide chemical used to destroy or control the growth of weeds. A. Germicide B. Herbicide C. Herbivore D. Fluorocarbon E. Hydrocarbon.	95.65%	100.00%
36.	Decomposed organic material. A. Fly Ash B. Ground Cover C. Enrichment D. Leachings E. Humus.	82.61%	95.65%
37.	Causing or capable of causing disease. A. Autotrophic B. Organic C. Pathogenic D. Flocculation E. Biological Oxidation.	82.61%	91.30%
38.	Referring to or derived from living organisms. A. Organic B. Bacteria C. Coliform D. Isomer E. Pathogenic.	86.96%	91.30%
39.	Lack of wind in an air mass or lack of motion in water which results in a concentration of pollutants. A. Radiation B. Sonic Boom C. Composting D. Stagnation E. Autotrophic.	95.65%	100.00%
40.	A pungent, colorless, toxic gas found in photochemical smog. A. Carcinogenic B. Oxidant C. Aerobic D. Uranium E. Ozone.	69.57%	77.27%
41.	The most abundant energy source now technologically available for use in the U.S. A. Natural Gas B. Nuclear Fission C. Nuclear Fusion D. Coal E. Petroleum.	52.17%	82.61%
42.	Most electrical power in this country is presently being generated by. A. Water B. Coal C. Petroleum D. Nuclear Fission E. Solar Energy.	73.91%	73.91%
43.	The efficiency of a well-tuned automobile is approximately ? percent of the potential energy derived from the consumed gasoline. A. Less than 10 percent B. 10 to 30 percent C. 30 to 50 percent		

		Scores	
		Pre-Test	Post-Test
	D. 50 to 75 percent E. 75 to 100 percent.	43.48%	63.64%
44.	It is estimated that we have enough known petroleum reserves to continue present consumption rates for another ? years. A. 15-25 B. 50-100 C. 100-200 D. 200-300 E. 300-500.	26.09%	69.57%
45.	Of the following types of energy, which has the greatest potential for the long-range future? A. Petroleum B. Coal C. Nuclear D. Nuclear Fusion E. Natural Gas.	52.17%	30.43%
46.	Of the following, which type of energy may become commercially feasible for home use in the next 20 years? A. Solar Energy B. Nuclear Fusion C. Biological Fuel Cells D. Hydrogen Fuel Cells E. Lead-Acid Batteries.	78.26%	95.65%
47.	A potential source of energy which is being tested on a commercial basis. A. Hydroelectric Power B. Coal Operated Steam Turbines D. Garbage Burning Plants D. Nuclear Fusion Plants E. Silicon Solar Cells.	60.87%	91.30%
48.	A potential source of energy which is available commercially in many parts of the world and is being presently researched. A. Hydroelectric Power B. Magnetohydrodynamic Devices C. Nuclear Fusion D. Biological Fuel Cells E. Geothermal.	39.13%	63.64%
49.	Which of the following sources or potential sources of energy is highly controversial due to potential hazards and pollution? A. Hydroelectric Power B. Geothermal Power C. Nuclear Fission D. Coal Gasification Plants E. Solar Energy.	78.26%	91.30%
50.	It can be truthfully said that. A. Higher standards of living require more energy. B. Nuclear power is relatively inexpensive. C. Coal reserves are adequate for only 50 years. D. Solar energy is easily harnessed. E. We are on the threshhold of successfully implementing national energy policies which will solve our problems.	73.91%	86.36%

APPENDIX B

RESULTS FROM THE LIKERT SCALE SECTION ON ENVIRONMENTAL EDUCATION

Please respond to the following statements by marking the most appropriate choice for each item on the corresponding number of the answer sheet.

5 Strongly Agree
4 Agree
3 Undecided or No Opinion
2 Disagree
1 Strongly Disagree

	Mean Pre-Test	Post-Test	
1. We live in a relatively closed life-support system on this earth.	4.22	3.7	N.S.
2. The relationship between organisms and their living and non-living environment are interrelated and interact upon each other.	4.74	4.83	N.S.
3. Human beings live in an ecosystem and have little ability to control the system.	1.70	1.61	N.S.
4. The human race should not attempt to control the population.	1.70	1.39	N.S.
5. The earth is capable of producing an unlimited amount of food.	2.83	2.78	N.S.
6. Raw materials are essentially inexaustable on the earth.	1.48	1.39	N.S.
7. Any person living on earth is responsible to all other persons living on earth.	4.17	3.87	N.S.
8. The amount of energy used by an individual has been on a gradual decline over the past ten years.	1.57	1.22	N.S.
9. Air pollution is not a problem except in the cities.	1.52	1.35	N.S.
10. One solution to providing more food is to clear off the jungles and plant crops.	2.26	2.48	N.S.
11. Land use is a private matter which should be left to the discretion of the individual owner.	2.17	2.04	N.S.

	Mean Pre-Test	Post-Test	
12. The use of nuclear fission as a source to meet future energy needs is a most promising method	3.43	2.83 α 0.0567	
13. I am confident that I can make a significant contribution toward solving complex problems relating to energy use.	3.48	3.57	N.S.
14. I am confident that I can make a significant contribution toward solving complex problems relating to pollution.	3.61	3.83	N.S.
15. The development of more freshwater lakes is one major way to increase energy resources without damaging the environment.	3.09	2.22 α 0.0070	
16. Land which is strip-mined can be successfully reclaimed to former productivity in less than ten years.	2.78	1.96 α 0.0081	
17. The hereditary characteristics of all living things can be altered by environmental conditions.	4.13	3.78	N.S.
18. Life itself is a chemical process, dependent on the environment for the energy and nutrients needed to sustain it.	4.61	4.65	N.S.
19. Thermal pollution has little affect on the life forms which occupy a water system.	1.74	1.48	N.S.
20. The limiting factors which control ecosystems and their organism ultimately control human activities.	3.96	4.30	N.S.
21. Most systems created by man require the use of energy rather than being energy sufficient.	4.22	4.43	N.S.
22. All food sources for man are directly or indirectly acquired from plants.	4.30	4.74	N.S.

	Mean Pre-Test	Post-Test	
23. Pollution is justifiable when economic conditions demand it.	2.13	2.22	N.S.
24. Electrical energy will be of little use when solar energy is satisfactorily developed for mass consumption.	2.52	2.17	N.S.
25. Petroleum supplies are being constantly replenished by natural process at the rate they are being used.	1.30	1.22	N.S.

APPENDIX C

RESULTS FROM THE SEMANTIC DIFFERENTIAL SCALE ON ENVIRONMENTAL EDUCATION

USE OF LAND

	A(1)	B(2)	C(3)	D(4)	E(5)		Mean Pre-Test	Mean Post-Test
Strong	___	___	___	___	___	Weak	1.43	1.52
Important	___	___	___	___	___	Unimportant	1.13	1.22
Bad	___	___	___	___	___	Good	3.04	3.13
Regulated	___	___	___	___	___	Unregulated	2.61	2.57
Successful	___	___	___	___	___	Unsuccessful	2.78	3.13
Simple	___	___	___	___	___	Complex	4.04	3.65
Realistic	___	___	___	___	___	Unrealistic	2.65	2.22

OFFSHORE DRILLING OF PETROLEUM WELLS

	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	2.39	2.00
Important	___	___	___	___	___	Unimportant	1.65	1.52
Bad	___	___	___	___	___	Good	2.87	2.57
Regulated	___	___	___	___	___	Unregulated	2.04	1.83
Successful	___	___	___	___	___	Unsuccessful	2.83	2.70
Simple	___	___	___	___	___	Complex	4.22	4.26
Realistic	___	___	___	___	___	Unrealistic	2.35	2.26

ACCESS TO LAKES AND WATERWAYS

	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	2.14	2.04
Important	___	___	___	___	___	Unimportant	1.74	1.73
Bad	___	___	___	___	___	Good	3.78	3.39
Regulated	___	___	___	___	___	Unregulated	2.13	2.39
Successful	___	___	___	___	___	Unsuccessful	2.48	2.35
Simple	___	___	___	___	___	Complex	3.22	3.22
Realistic	___	___	___	___	___	Unrealistic	2.35	2.17

POPULATION CONTROL	A(1)	B(2)	C(3)	D(4)	E(5)		Mean Pre-Test	Mean Post-Test
Strong	___	___	___	___	___	Weak	1.52	1.48
Important	___	___	___	___	___	Unimportant	1.39	1.26
Bad	___	___	___	___	___	Good	3.83	3.43
Regulated	___	___	___	___	___	Unregulated	2.70	2.65
Successful	___	___	___	___	___	Unsuccessful	3.61	3.22
Simple	___	___	___	___	___	Complex	3.91	4.04
Realistic	___	___	___	___	___	Unrealistic	2.43	2.17

PLANNING OF FUTURE CITIES	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	1.65	1.83
Important	___	___	___	___	___	Unimportant	1.70	1.70
Bad	___	___	___	___	___	Good	3.83	3.74
Regulated	___	___	___	___	___	Unregulated	2.30	2.43
Successful	___	___	___	___	___	Unsuccessful	2.83	3.04
Simple	___	___	___	___	___	Complex	3.78	4.17
Realistic	___	___	___	___	___	Unrealistic	1.91	1.83

DEVELOPMENT OF NATIONAL PARKS	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	1.30	1.61
Important	___	___	___	___	___	Unimportant	1.52	1.48
Bad	___	___	___	___	___	Good	4.17	3.96
Regulated	___	___	___	___	___	Unregulated	1.78	1.74
Successful	___	___	___	___	___	Unsuccessful	2.17	2.00
Simple	___	___	___	___	___	Complex	3.13	3.43
Realistic	___	___	___	___	___	Unrealistic	1.70	1.65

USE OF FORESTS

	A(1)	B(2)	C(3)	D(4)	E(5)		Mean Pre-Test	Mean Post-Test
Strong	___	___	___	___	___	Weak	1.30	1.35
Important	___	___	___	___	___	Unimportant	1.35	1.17
Bad	___	___	___	___	___	Good	3.09	3.87
Regulated	___	___	___	___	___	Unregulated	1.96	1.87
Successful	___	___	___	___	___	Unsuccessful	3.04	2.13
Simple	___	___	___	___	___	Complex	3.65	3.87
Realistic	___	___	___	___	___	Unrealistic	2.17	2.04

CROP ROTATION

	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	1.60	1.57
Important	___	___	___	___	___	Unimportant	1.39	1.43
Bad	___	___	___	___	___	Good	4.04	3.74
Regulated	___	___	___	___	___	Unregulated	3.09	2.52
Successful	___	___	___	___	___	Unsuccessful	2.70	2.43
Simple	___	___	___	___	___	Complex	2.70	2.74
Realistic	___	___	___	___	___	Unrealistic	2.00	1.52

STRIP-MINING

	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	1.87	1.91
Important	___	___	___	___	___	Unimportant	2.00	1.78
Bad	___	___	___	___	___	Good	1.78	1.91
Regulated	___	___	___	___	___	Unregulated	2.09	2.13
Successful	___	___	___	___	___	Unsuccessful	3.6	3.65
Simple	___	___	___	___	___	Complex	3.2	3.96
Realistic	___	___	___	___	___	Unrealistic	2.87	2.97

FOOD PRODUCTION	A(1)	B(2)	C(3)	D(4)	E(5)		Mean Pre-Test	Mean Post-Test
Strong	___	___	___	___	___	Weak	1.39	1.43
Important	___	___	___	___	___	Unimportant	1.17	1.22
Bad	___	___	___	___	___	Good	3.78	3.68
Regulated	___	___	___	___	___	Unregulated	2.70	2.43
Successful	___	___	___	___	___	Unsuccessful	2.43	2.61
Simple	___	___	___	___	___	Complex	3.83	3.96
Realistic	___	___	___	___	___	Unrealistic	1.78	2.04

BREEDER REACTORS	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	1.96	1.70
Important	___	___	___	___	___	Unimportant	1.92	2.00
Bad	___	___	___	___	___	Good	3.35	2.09
Regulated	___	___	___	___	___	Unregulated	2.17	2.00
Successful	___	___	___	___	___	Unsuccessful	2.91	3.26
Simple	___	___	___	___	___	Complex	3.83	4.30
Realistic	___	___	___	___	___	Unrealistic	2.17	2.91

GAS MILEAGE FOR CARS	A(1)	B(2)	C(3)	D(4)	E(5)			
Strong	___	___	___	___	___	Weak	1.30	1.52
Important	___	___	___	___	___	Unimportant	1.30	1.30
Bad	___	___	___	___	___	Good	3.09	3.04
Regulated	___	___	___	___	___	Unregulated	2.52	2.35
Successful	___	___	___	___	___	Unsuccessful	3.52	3.83
Simple	___	___	___	___	___	Complex	3.70	3.43
Realistic	___	___	___	___	___	Unrealistic	2.39	1.70